FIELD REPORT OF THE 1974 FOREST SERVICE

DDT - DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT

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INTRODUCTION

In December 1973, the USDA-Forest Service, in cooperation with the States of Washington, Oregon and Idaho, and the USDI-Bureau of Indian Affairs and Bureau of Land Management, filed a draft Environmental Impact Statement requesting the use of DDT to control the Douglas-fir tussock moth Orgyia pseudotsugata in the Pacific Northwest. Under usual circumstances, the tussock moth -- a native insect of the Northwest -- exists in endemic numbers. Periodically, it increases to epidemic proportions and can defoliate large acreages of its host trees -- Douglas-fur and true firs. Surveys in fall 1973 had indicated that there would be high tussock moth populations in summer 1974. The Forest Service request, however, was contingent upon further evaluation of the tussock moth population, biological control factors and climatic factors that could cause a population collapse before significant damage occurred.

In early 1974, the Environmental Protection Agency held public hearings in Portland, Walla Walla, Coeur d'Alene and Washington, D.C. on the possible use of DDT against the tussock moth. Extensive testimony was collected from many concerned parties. On February 26, 1974, Russell Train, Administrator of the EPA, granted the USFS an emergency exemption under Section 18 of the Federal Insecticide, Fungicide, and Rodenticide Act (as amended) for DDT use on tussock moth in Washington, Oregon and Idaho. The EPA Order (attached) includes information about the biology of the tussock moth, the history of past infestations, and possible control techniques. DDT use would be permitted only if the Forest Service determined that an actual emergency, which would not be controlled naturally, exists. In granting the exemption, the Administrator imposed numerous safety restrictions and also required that the Forest Service conduct comprehensive research on DDT alternatives. In April 1974, the Forest Service filed a final EIS which provided additional biological data in support of their original request.

This report is a summation of the Forest Service tussock moth spray operation, field observations and evaluations made by EPA employees in the field during preparation and spraying procedures. Throughout the report, specific documented examples will be mentioned to clarify certain activities and to point out problem areas.

THE CONTROL PROJECT

EPA Region X assigned five employees to observe and report on all tussock moth control project activities including what areas had been treated with DDT, what areas were added to or eliminated from the treatment blocks and any accidents involving DDT. Four of the EPA observers were assigned to individual spray units; the fifth worked out of the project headquarters. They worked directly with project personnel (Forest Service, State or BIA) involved in each of the project functions.

EPA personnel actively participated in all training and briefing sessions held throughout the project. Since activities in each unit varied in time, duration, and procedures, each EPA person had to use his/her time very judiciously in order to keep abreast of any possible problem areas and to be constantly aware of the overall project program. EPA accompanied the biological aids during entomological plot establishment and during pre and post spray larval and foliage sampling. Independent spot checks of the plots were periodically made by EPA and unit entomologists for quality control. EPA also assisted environmental monitors and air operation officers in collecting samples and locating heliports respectively.

During actual spray operations, EPA personnel were in constant contact with the heliport manager, weather and aerial observers and the unit spray operations officer. Time spent in the air with the aerial observer was of considerable value since one could directly observe all spraying and effects of local weather conditions on the spray pattern. DDT storage tanks were continually monitored to insure that proper safety procedures were being followed. EPA also accompanied Forest Service safety officers as checks were made on helicopter loading sites (heliports).

Following daily spray activities, EPA would make various checks of spray deposit cards to insure proper spray deposition and to document any drift into buffered areas. A complete record of spray deposit should be available since all spray cards were collected and retained by the Forest Service.

Daily review of all entomological survey data and spray records were also made by EPA. Any activity in question as to a possible violation was discussed with Forest Service officials. This led to a very candid working relationship. It is the consensus of the EPA field crew that our presence alone favorably influenced Forest Service activities in a manner consistent with the EPA Order.

In addition to the above mentioned activities, EPA participated in public meetings, news media interviews and spent time with industrial and congressional liaison people, and environmental groups. This public exposure helped qualify EPA's role in trying to minimize any additional hazards associated with the use of DDT in a forest ecosystem.

Field preparations started in mid-May. The Forest Service project headquarters was set up in Walla Walla, Washington. Unit headquarters were set up in La Grande, Enterprise and Halfway, Oregon; Clarkston and Coulee Dam, Washington; Potlatch and Fairfield, Idaho. Each unit headquarters was staffed with approximately 35-40 people, except the one in Fairfield which had a staff of five.

Throughout the entire tussock moth suppression project, Forest Service field personnel performed in a conscientious and responsible manner. They were cognizant of the job they were performing and also of the environmental restraints imposed, if not by the EPA Order, by public opinion. These people were helpful and honest in their relationship with the EPA observers and the lines of communication were very good.

Pre-spray Preparations

Aerial reconnaissance of the scheduled treatment area helped the entomologists establish working units (spray blocks) and identify non-host type, meadows and non-timbered areas. The blocks had to be of reasonable working size, identifiable from the air and contain synchronously-hatching tussock moth populations. Block size varied from 128 to 13,705 acres. Topographical features, such as ridges, draws, valleys, roads and meadows, served as boundaries wherever possible. The timing of egg hatch varied with location and elevation. Elevation in the sprayed areas ranged from 2500 to 7000 feet; egg hatch occurred sooner at lower elevations and on south or west exposures.

Once block boundaries were established on maps, ground marking began. If prominent topographical features were not present, boundaries were flagged. Strips of bright orange flagging were placed in tree tops by sling shot or by dropping them from a helicopter. Long strips of white toilet paper, kytoons or smoke bombs were also used to mark boundaries.

The EPA Order required that an unsprayed buffer strip of at least 200 feet be left along live streams and waterways. Accordingly, the Forest Service buffered Class I streams which are defined in the Oregon Forestry Practices Act (24-101) as "valuable for domestic use, are important for angling or other recreation and/or used by significant numbers of fish for spawning, rearing or migration routes. Stream flows may be either perennial or intermittent during parts of the year." All buffered streams were marked on maps and on the ground where necessary.

Biological Sampling

The objectives of the entomological field activities were to: (1) determine the time for spray block release, (2) measure tussock moth population survival, (3) assess the amount of foliage saved, (4) measure the number of egg masses in the fall, following treatment, and (5) determine the success of the treatment in terms of preventing top kill and tree mortality.

To determine the release date of a spray block, representative egg hatch plots were established. Within each plot, egg masses were tagged and observed daily. A block was released for spraying three days after 70% of the tagged egg masses had begun to hatch. In the case of inaccessible blocks, data from comparable areas nearby were used.

In order to measure population survival and assess the amount of foliage saved, randomly chosen plots were established. A minimum of 75 plots (15 in untreated areas and 60 in treated areas) were established in each unit. Additional plots were added if time permitted. Each plot consisted of three trees -- of the species Douglas-fir or grand fir, 30 to 50 feet tall, which were open grown with less than one-fourth of the top crown defoliated. Some of the randomly selected plots could not be sampled because

of inaccessibility or because adequate foliage was not present due to defoliation in previous years.

Trees were sampled by visually classifying the different crown levels to determine the intensity of defoliation, and by collecting foliage to assess needle damage of new growth. Larval counts were also made. Data were taken with a 72-hour period before spraying and at 4 and 21 days after spraying. The same trees will be examined this fall for new egg masses and for visual classification of crown damage.

A separate evaluation to determine effectiveness of DDT in preventing growth loss, tree mortality and top kill will be done in fall 1974 and will continue for several years. This evaluation will be in conjunction with an on-going Forest Service study of impact plots established in Oregon and Washington in 1973.

Environmental Monitoring

The environmental monitoring involved both state and federal agencies with the Forest Service as the lead agency. This program consisted largely of measuring DDT levels, before and after spraying, in water, soil-sediment, aquatic organisms, fish, small mammals and birds. Sampling will continue into 1975. The Forest Service will issue an interim report December, 1974 and a final report in December, 1975.

EPA's Region X laboratory has established a quality control program and provided standard reference samples for all laboratories involved in the DDT residue analysis. This laboratory will also be analyzing 10% of the samples collected in the environmental monitoring.

Spraying Activities

In the entire spray project, 420,944 acres were treated with 423,026 gallons of DDT formulation. An additional 11,675 acres were treated for research purposes with Dylox, Sevin and lower doses (1/4 & 1/2 lb./acre) of DDT. The attached table and figures describe the acres treated by state, project administrative unit, and chemical used.

Approximately 106,214 acres that had originally been scheduled for spraying were subsequently excluded. The majority of this acreage, 40,460 acres in the La Grande unit and 43,600 acres in the Pomeroy unit, was dropped after first instar larval surveys indicated low population. Subsequent aerial surveys of these areas have shown very little visible defoliation.

Acreage not originally scheduled for spraying was added to the spray area. Occasionally boundaries were changed to fit natural topographical features leading to slight increases in acreage. A larger addition of

79,161 acres, involved newly damaged areas which were observed during aerial surveys. In these areas, the feeding larvae caused the foliage to dry out and turn a yellowish-red. A majority of these areas were checked on the ground to verify that the damage was due to tussock moth and not some other defoliator.

Technical grade DDT was produced by Montrose Chemical Corporation of California and shipped to Walla Walla, Washington. There it was formulated into 3/4 pound of DDT per one gallon diesel fuel by Harbor Distributing Company of Portland, Oregon. A factory inspection was performed at this firm by EPA Region X on June 11, 1974. Samples were collected of technical DDT and DDT 10.2% product. Analysis by EPA's San Francisco laboratory found these samples to be in compliance. The Forest Service sampled each batch of DDT formulation and chemical analysis was performed to determine whether the product met specifications. Tank trucks from the formulator carried the DDT first from Walla Walla to storage tanks in each unit and applicator tank trucks then moved it to the helicopter loading sites (heliports).

During transfer and loading procedures, there was minimal spillage. For example, the supervisor of the Pomeroy spray unit reported a small pinhole leak in a storage tank from which an estimated three quarts were lost. Changing hose hookups caused an additional quart spillage. Similar small spills occurred when hoses were connected and disconnected during the loading of tank trucks and helicopters. These were not considered serious enough by the Forest Service to require written reports.

Charcoal, both loose and bagged, was available at the heliports and the unit headquarters for use in absorption of spilled DDT formulation. Since no direct spillage took place in any of the waterways, the bagged charcoal was not needed. The loose charcoal was used periodically during loading and unloading of tank trucks when small amounts of spray were spilled.

Prior to spraying, heliports were established at locations which served a maximum number of spray blocks, had easy access for the DDT tank trucks and were safe for helicopter operation. During spray operations, a heliport manager supervised and recorded all activities taking place at the heliport in use. EPA field people observed some leaky nozzles and sloppy loading procedures and notified heliport managers. As a result, the spray ships were grounded until nozzle adjustments were made. Even so, leaky nozzles continued to be a problem. Most of the applicator personnel were very conscientious about spilling or self-contamination.

Each spray unit had a mobile meteorological laboratory manned by a meteorologist and several weather observers. During spray operations, temperature, humidity and wind readings were taken every 15 minutes. Spraying stopped when wind or temperature exceeded their respective limits of 6 m.p.h. and 70° or when thermal updrafts or high winds disrupted the normal spray pattern. There was great variability of conditions within the spray blocks due to mountainous terrain. Conditions at the application site at times differed from those where the weather observers were. The Forest Service project work plan specified that aerial observers were to maintain constant surveillance of all spray aircraft. This surveillance was adhered to in most instances.

Spraying began at daylight, 4:30-5:00 AM, and continued until adverse weather conditions warranted shut down. Shut down time varied greatly with actual spray time reaching as high as six hours. Before each block was sprayed, Forest Service project card checkers placed oil-sensitive cards along some buffered streams and along checklines at right angles to spray swaths. After a block was sprayed, they gathered these cards and the broad leaves of some plant species which are sensitive to oil deposits. EPA personnel made independent spot checks with their own oil-sensitive cards. Visual examination of these cards showed a small to medium deposit of spray drift along the banks of some of the buffered streams. For example, visual examination of spray cards by Forest Service personnel in the Wallowa unit showed deposits ranging approximately from .001 to .04 lbs. of DDT/acre. The procedure for these determinations was outlined in a Forest Service manual, "Standards for estimating airplace spray deposit on oil-sensitive cards." At the request of the Forest Service, a few of the oil-sensitive cards from the La Grande unit were sent to the Oregon Department of Agriculture laboratory for DDT analysis. Laboratory analysis found 3-3.8 time less the amount of DDT than visual examination of the cards had indicated. This discrepancy leads us to question the accuracy of DDT deposit estimates.

There were few reports of direct spraying within the 200 foot buffer zone along state-designated Class I streams. One such incident did occur when 9-mile Creek in the Colville unit was directly sprayed in a single pass which was perpendicular to the stream bed. The spray pilot was a substitute and apparently had not been adequately briefed on the location of streams to be buffered. The project environmental monitors had sample plots located downstream from the sprayed area. Their results will be available in the environmental monitoring report. Regular pilots were briefed daily on critical areas, boundaries and buffer zones in the blocks to be sprayed the following day. Pilots unfamiliar with these spray blocks were flown over said area. There were no reports of spraying outside of designated boundaries.

Some streams bearing fish were not classified as Class I streams. Monitoring and electrofishing by the Pomeroy unit environmental monitors of a 1/4 mile segment of George Creek, not listed as a Class I stream, yielded 44 trout, varying in length from 2-8 inches. Such observations led the Forest Service unit personnel to buffer some streams and waterways not originally scheduled for buffering.

Research

Forest Service research activities directed toward registerable alternatives for 1975 include the following:

1. Pilot tests with Dylox and Sevin-4-oil.

a. Halfway, Oregon - Sevin-4-oil (2 lbs./gal. oil/acre) and Dylox (1.5 lb./gal. of formulation/acre) were aerially applied to 3 replicate plots (approximately 500-1000 acres) each in late June and early July. Total acreage treated was 2,495 with Sevin and 1,615 with Dylox. Check plots

both untreated and treated with DDT 3/4 lb./acre were also included.

b. Enterprise, Oregon - Two plots approximately 360 and 465 acres were aerially sprayed with Dylox (1.5 lb./gal. of formulation/acre). Untreated check plots were included.

c. Potlatch, Idaho - Sevin-4-oil (2 lb./gal. oil/acre) was applied to two approximately 700 acre plots (1,380 acres total). Representative untreated check plots were also included.

d. Frenchtown, Montana - 680 acres were sprayed with Sevin-4-oil (1 lb./2 gal. oil/acre). Included were untreated check plots.

2. Large scale plots treated with reduced DDT rates in Halfway, Oregon.

-- DDT was applied at rates of 0.25, 0.5 and 0.75 lb./gal. fuel oil/acre to 3 replicate plots (approximately 1000 acres) each in late June. Untreated check plots were also included.

3. Sevin-4-oil, Dylox small field tests in Halfway, Oregon.

-- This testing consisted of 12 plots; 3 replicate plots of Dylox (1 lb./5.3 pints of formulation/acre), Sevin-4-oil (1 lb./1 quart of formualtion/acre), DDT (0.75 lb./1 gal. oil/acre) and untreated controls. The plots were 60-80 acres each.

4. Microbial testing.

-- Dipel Bacillus thuringiensis (BT) (1 lb./2 gal. water/acre) was applied to ~~100~~ 200 acres near Missoula, Montana. Spraying took place in mid-June.

The pilot tests planned for BT and nuclear polyhedrosis virus (NPV) in the Coeur d'Alene and Nez Perce National Forests were abandoned due to a tussock moth larval collapse in the scheduled treatment area and inability to locate suitable test areas elsewhere. A total of 27,000 acres was to be treated (20,000 with BT and 7,000 with NPV).

Accidents

There were five major accidents reported from the field. The first occurred on June 17 in the Sawtooth unit in southern Idaho. A pilot inadvertently hit the emergency dump lever while spraying, and a total of 60 gallons were spread out over several hundred yards. The nearest water was approximately 150 feet downslope. It was a small brook that was not designated as a Class I stream but was a tributary of buffered stream. No decontamination was attempted. Insect and fish samples were collected by Idaho State Fish and Game Commission and sent to the project environmental monitoring coordinator.

The second accident occurred on June 22 in the Colville unit when a pumpline ruptured. An estimated 50 gallons were spilled on the ground. The contaminated areas were hosed down with water and the soil was turned and covered with uncontaminated soil. Three days later, a bulldozer dug a three foot hole, into which alternate layers of charcoal and contaminated soil were pushed. After filling, the soil was packed down and grass seed was spread on top.

On June 23 in the Pomeroy unit, a spray helicopter (Bell 47G3B-2) crashed. Upon impact, the ship caught fire. Inspection by the EPA unit observer indicated that approximately 97% of the DDT formulation was thermally decomposed. The remaining several gallons were scattered out from the storage tank that detached from the helicopter upon impact. Charcoal was scattered on the ground where there was evidence of diesel fuel. The closest open water was a small stream about 250 yards downslope.

The fourth accident took place on July 8 in the St. Joe unit near Moscow, Idaho. A tank truck loaded with Sevin-4-oil turned over while attempting to pull off the highway resulting in a 800 gallon spillage onto the gravel turnout. A sand dike was built to block the narrow pit. Sand and sawdust was immediately placed over the contaminated area. This was topped with a sand/clay mixture.

The final accident occurred on July 19 in the Wallowa unit. When the spray ship lost power on take-off, 60 gallons were purposely dumped. Since this occurred on privately-owned land, the owner was notified and the decontamination alternatives were explained to him. The contaminated area has been fenced off to prevent grazing or browsing by domestic and wild animals. The nearest stream course was about 0.4 mile away.

The EPA field crew observed few wildlife kills. This is not surprising since their duties did not include taking drift samples of streams or running transect lines through wooded areas specifically looking for dead and moribund wildlife. However, EPA personnel received reports of, and in some cases observed, fish and aquatic insect kills which were being sampled by environmental monitors.

EVALUATION

The following is the EPA field staffs' evaluation of compliance by the Forest Service with the spray restrictions, , monitoring, and research requirements within EPA's Order of March 5, 1974.

Spray restrictions (as numbered in the EPA Order)

1. The Forest Service sampled and collected egg masses in fall 1973; they also determined the viral incidence of larvae hatched from these eggs. These data were used to estimate the 1974 larval populations and to decide what areas

required treatment. The inaccuracy of these estimates is clearly illustrated by the fact that 106,000 acres, of the approximately 460,000 acres scheduled for treatment on the basis of egg surveys, had insufficient larvae to warrant spraying. Also, approximately 45% of the 79,161 acres sprayed due to visible defoliation had been included in the fall egg mass surveys and judged not to require treatment. More reliable measurements of larval populations are possible from direct field larval counts. The Forest Service did some pre-spray larval sampling in its "cluster plot" analysis. However, this analysis was primarily intended to evaluate DDT efficacy over the entire project. This pre-spray larval survey did not adequately ensure an accurate count of larvae in each spray block because:

1) an insufficient number of samples was included.

2) all spray blocks were not sampled.

3) sampling occurred before an established first instar larval population was present. Thus, a varying proportion of the eggs had not yet hatched and adequate larval dispersion had not yet occurred.

4) established and declining tussock moth populations were inappropriately sampled using methods and assumptions designed to measure incipient populations.

Not True

In addition to the inadequacies of the survey, the Forest Service workplan did not guarantee that if the larval populations fell below the threshold density of 20 larvae/1000 in.^{2}, a spray block would be re-evaluated or eliminated from treatment. This and the inadequacies of the larval survey could lead to the unnecessary spraying of areas which did not have tussock moth populations large enough to warrant treatment.

During the spray operation, several unit entomologists expanded or initiated first instar larval surveys. They used the surveys to evaluate the larval populations scheduled for treatment. In the Pomeroy unit, new sample sites were added to supplement the cluster plot sites and first instar larvae were sampled. On this basis 37,996 acres were eliminated from treatment. This acreage has shown no subsequent defoliation. In the La Grande unit, the entomologist initiated an original sampling system. Here, 40,460 acres were eliminated from treatment because of insufficient larval populations; only about 5% of this acreage showed defoliation.

Comparisons of pre and post spray larval samples made in the cluster plot analysis will be used to measure DDT efficacy. When the results of these analyses are available, an evaluation will be possible.

2. The EPA Order requires that spraying be done to "ensure that DDT does not drift into these buffer strips." The 200 foot buffer strip was inadequate to prevent DDT drift entirely. Even broader buffer strips (300-400 feet), which were periodically used, were unsuccessful in keeping all drift out of streams.

3. Class I streams were marked on photos and maps and on the ground where

not clearly identifiable by topographical features.

4. Spray cards were used in treated areas to measure spray deposit. Applicators were paid on the basis of adequate coverage as judged from these cards.

5. Spraying did not take place when weather conditions adversely affected spray settling.

6. All livestock owners within the treatment areas were notified by the Forest Service and to extent possible, livestock were removed. The Forest Service plans to notify hunters this fall of possible game contamination.

7. The public was notified through the news media, of areas to be sprayed and the date and duration of the spraying.

8. The applicators were licensed and familiarized with operational details and procedures.

9. Deposition of spray at the target area was monitored during spraying using oil-sensitive cards.

10. Spray boundaries were marked with flags, kytoons, and smoke bombs where topographical features did not permit clear aerial identification of the boundaries.

11. Records consisting of spray locations, quantity, times and places were submitted to EPA August 7, 1974.

Monitoring requirements

A monitoring program was conducted and the Forest Service will issue interim and final reports in December 1974 and 1975 respectively.

Research Program

The research on DDT alternatives completed by the Forest Service in 1974 fell far short of the originally proposed work. One reason was that many proposed test plots were unsuitable. These areas had low tussock moth populations and/or high virus levels. Some areas could not be used for research at all while others could only be used for abbreviated experiments. Because of high viral levels in some larval populations, researchers doubted, even before the experiments began, whether any meaningful biological results could be obtained. Technical problems with materials and equipment also hindered research activities.

RECOMMENDATIONS

Research

The 1974 research program was reduced because many of the areas originally slated for research contained unsuitable tussock moth populations. This problem might have been avoided had a number of alternate areas been designated for possible research use. These areas could have been surveyed for egg numbers, parasites, and viral incidence in the spring. The areas best suited for testing could be determined and the remaining areas scheduled for pesticide treatment or held for further observation as appropriate. In projects where test material is applied in a later larval instar (e.g. microbials are used on second instar larvae), first instar larval surveys could also be performed on alternate sites to find the best test site.

Technical problems hindered the 1974 research efforts. Because of the cyclic nature of tussock moth epidemics, the need to examine DDT alternatives when larval populations are high is imperative. Then, knowledge about controlling tussock moth populations will be available the next time there is an epidemic. Therefore, it is reasonable and advisable to devote considerable time and personnel to preparatory work to eliminate technical problems before actual testing begins.

Finally it may be advisable to have contingency plans for research in 1975 on any appropriate tussock moths populations that may occur.

Stream classification

In the future a clearer definition of what constitutes a "live stream or waterway" is called for since streams, not falling within the definition of Class I streams, had viable fish populations. (See example p.6). Some of these were buffered at the discretion of field personnel; others were not. Spraying these streams with DDT could adversely affect fish populations.

Censusing insect populations

Surveys used to sample tussock moth egg and larval populations should be improved in the future. The EPA Order stated that "The validity of the laboratory data (on egg numbers) shall be verified by field surveys carried out at the time of natural egg hatch." If this statement intended that accurate larval surveys be used to reach treatment decisions, it should be more clearly stated in the future.

This year, Forest Service researchers found evidence that estimates of viral incidence based on egg masses collected in the spring can be more accurate than those based on fall-collected egg masses. Taking these results into account would improve future determinations of viral incidence.

Safety and Care in handling DDT

Some of the minor DDT spills occurring at heliports and storage areas were due to leaky nozzles and carelessness during DDT transfer operations

and minor repair work on spray apparatus. If contracts included penalties for such spills, applicator care in handling DDTand maintaining spray apparatus might improve.

Judging the efficiency of spray settling

Meteorological measurements were taken to assure that DDT was applied only when the spray would settle efficiently. As part of this effort, weather observers were stationed in the spray blocks and took readings every 15 minutes. This use of weather observers might not be necessary since:

1) Meteorological conditions varied greatly within a spray block. Conditions at the DDT application site at times differed from those where the weather observer was.

2) The efficiency of spray settling is a function of meteorological conditions but did not rigidly depend on the temperature and wind limitations in the EPA Order.

3) The value of the information they gathered might not justify their daily exposure to DDT.

4) Adequate weather readings could be taken by other heliport personnel, e.g. the load checker.

In fact the aerial observers were in the best position to judge where and how efficiently the spray was settling. However for the aerial observers to do that job, their role should be clarified. The Forest Service initially indicated that "there will be surveillance of all spraying by Forest Service or State observers flying in helicopters accompanying the application helicopters" but, in a later memo, said that this was not necessary.

Boundary markings

Using flagging and topographical features for boundary markers is not always accurate. More research is needed on guidance systems for aerial application of pesticides.

SUMMARY AND CONCLUSION

From on the spot observations by a field staff of five Environmental Protection Agency scientists,it is evident that there were no flagrant violations of the EPA Order of March 5, 1974 regarding application of DDT by the Forest Service to control the Douglas-fir tussock moth. However, research efforts of the Forest Service did not meet the spirit of the Order.

Complete evaluation of the entire project, including monitoring cannot be made until the Forest Service issues its final reports.

ENVIRONMENTAL PROTECTION AGENCY

USE OF DDT TO CONTROL THE DOUGLAS-FIR TUSSOCK MOTH

Order on Request for an Emergency Exemption

On June 14, 1972, the Administrator of the Environmental Protection Agency (EPA) issued an order cancelling most uses of DDT. This order was issued under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. 135 et seq.) following seven months of hearings. The use of DDT for control of the tussock moth was not specifically addressed in that order, but there is no present registration of DDT for this purpose. Use of DDT for control of the tussock moth is therefore presently prohibited.

On January 3, 1974, the U.S. Forest Service requested an exemption from this prohibition for the contingency use of DDT to control a potential emergency outbreak of the Douglas-fir tussock moth on Federal, State, and private lands in Oregon, Idaho, and Washington. The States of Washington and Oregon have made separate similar requests. These requests are made pursuant to Section 18 of FIFRA as amended by Pub. L. 92-516 (86 Stat. 973) which provides that the Administrator of EPA "may, at his discretion, exempt any Federal or State agency from any provision of this Act if he determines that emergency conditions exist which require such exemption."

This order sets forth the Agency's disposition of these requests.

I. *Background.* A. *The 1974 Request.* The U.S. Forest Service requests an exemption from the registration requirements of FIFRA on a contingency basis. If the exemption is granted, the Forest Service will determine in May and early June whether DDT use is necessary to control the tussock moth, given conditions at that time. The Forest Service presently estimates that perhaps as many as 650,000 acres will require spraying in order to prevent serious tree damage. At a rate of 0.75 pounds per acre, approximately 490,000 pounds of DDT might therefore be required. This compares with the more than 150 million pounds of DDT which were used worldwide, and the 20 milliion pounds used in the United States at the time of the 1972 Order.

The Forest Service made its request for the use of DDT conditional upon a finding that emergency conditions exist after the 1974 egg hatch, and that natural controls will not reduce the larval populations to tolerable levels.[1] The Forest Service requested that EPA decide on this contingency request before March 1, 1974, to allow sufficient planning and contractual lead time. Application of DDT, if authorized, would occur in late May or early June when the moth larvae emerge from the egg masses.

B. *The 1973 Request.* In the spring of 1973, EPA received similar requests for emergency exemptions for the use of DDT to control the tussock moth from the U.S. Forest Service, several towns in the Blue Mountains area of Oregon and Washington, and from the Boise-Cascade Corporation. An Environmental Impact Statement was filed by the Forest Service covering last year's proposed DDT Spray Program.

EPA denied all of the 1973 requests for the emergency use of DDT. Many forests and entomology experts predicted that the tussock moth population would collapse as a result of the presence of a nuclear polyhedrosis virus, a natural enemy of the moth. EPA recognized that some tree damage would result before the collapse could occur, but this damage was not expected to be large enough to outweigh the risks of DDT use. While the virus may have caused collapse in certain areas of the infestation, the 1973 damage exceeded expectations, and significant new infestations developed in the summer of that year.

C. *EPA's Processing of the 1974 Request.* In addition to the contingency request of January 3, 1974, the U.S. Forest Service, in cooperation with the U.S. Department of the Interior, prepared a Draft Environmental Impact Statement (DEIS) which was submitted to the Council on Environmental Quality on December 28, 1973. The Forest Service has requested comments on this Draft Statement, and has stated that it intends to file the final Environmental Impact Statement sometime in March, 1974.

The DEIS covers only the actual application of the chemical by the Forest Service, and in no way is binding upon the EPA decision. The EPA decision need not, and cannot, because of the lead time required to prepare for the 1974 control program, await the filing of the final EIS. The DEIS was prepared pursuant to the requirements of the National Environmental Policy Act (83 Stat. 852), while the Environmental Protection Agency decision is governed by the provisions of the FIFRA. The Draft Environmental Impact Statement has provided EPA with considerable information to support the Forest Service request, but the Agency was not limited to this or any other source of information in making its decision.

In fact, the Agency has conducted extensive investigations of the entire issue ranging far beyond the DEIS. Agency officials have attended meetings of the Interagency Tussock Moth Steering Committee, an intergovernmental group which has made efforts to determine the need for and the methods of tussock moth control. EPA sponsored a Technical Information Seminar to examine the means for control of the tussock moth on November 16, 1973 in Seattle, Washington. EPA held four public hearings on the issues raised by the Forest Service's request for the use of DDT and by the Draft Environmental Impact Statement between January 14 and January 30, 1974, in the Pacific Northwest, and a final hearing in Washington, D.C. on February 1, 1974. Members of the public were invited to testify or submit written statements, and the record of these hearings were held open until February 4 to receive public comment. Numerous public officials testified at these hearings and many others submitted statements.

After initial review of the DEIS, EPA felt that additional information was needed from the Forest Service. Accordingly, by letter of January 21, 1974, the Agency requested response from the USDA-Forest Service to numerous detailed questions. A reply was received from the Head of the Forest Service dated February 5, 1974, which provided some additional information. In further response to the EPA letter and subsequent meetings with the Forest Service, USDA has made available to EPA copies of preliminary work plans, monitoring plans, and draft research designs for continuing Forest Service work on tussock moth control.

Additionally, EPA officials met with Forest Service research and field personnel in the Pacific Northwest during the month of January. At these meetings EPA reviewed and discussed the methodology and criteria used by the Forest Service to survey egg, larvae, parasite and virus populations, and the status of development of alternatives to DDT.

D. *The Douglas-fir Tussock Moth—Description and Biology.* The Douglas-fir tussock moth (*Orgyia pseudotsugata* McDonnough) is a native insect of the Northwest and a natural component of the forests in that area. Under usual circumstances it exists in endemic numbers but periodically increases to epidemic proportions and defoliates large acreages of its host trees. The Douglas-fir tussock moth produces one generation per year. Egg masses are laid on tree branches and trunks in the fall, and remain there through the winter; the larvae emerge from the egg masses in late May or early June after the host trees have begun new growth. The larvae feed on new foliage first, and, as they grow larger, begin feeding on the older foliage. It is during their five to seven larval states, particularly from the second instar on, that severe defoliation may occur. When mature, usually from late July to the end of August, the larvae pupate and emerge in 10 to 18 days as adult moths. Mating takes place on the cocoon where the female deposits a mass of eggs, averaging about 200 eggs per mass. Adult moths do not feed, and die within a few weeks. Because the female moth cannot fly, the population can spread only by wind dispersal of the larvae.

The tussock moth is most susceptible to control during the early larval stages (late May or early June). The tussock moth has many natural enemies, including disease organisms, insect parasites, predators, and birds. A nuclear polyhedrosis virus appears to be the major natural mortality factor in the dramatic population collapses that have terminated many previous outbreaks. This virus usually become significantly active in the third year of the population outbreak.

The exact relationship between the presence of tussock moth larvae and tree damage is not clear. We are certain that as the larvae population decreases toward

[1] January 3, 1974, letter to Russell E. Train from Paul A. Vander Myde, Deputy Assistant Secretary, Conservation, Research and Education, USDA.

zero, the amount of defoliation and tree mortality decreases. Exactly where the threshold points are, however, has not been clearly established. Even if these threshold points were known for certain, the task of determining exactly what the population of larvae is at any one time on a tree or on a group of trees is subject to serious measurement difficulties. Also relevant in forecasting the amount of damage which may occur from a particular population of larvae are: the extent of the virus population and other natural enemies of the larvae; whether the population of larvae is increasing or decreasing; and whether or not the trees have suffered previous damage. In short, although we know a considerable amount about the biology of the tussock moth, and its relationship to the forest on which it preys, there are still many areas where further knowledge is needed.

E. *Previous Outbreaks.* The first recorded tussock moth outbreak occurred in 1918 near Chase, British Columbia. Since then, major epidemics have occurred every decade in the fir forests of Western North America. Outbreak periods of the tussock moth seem to compress into three year cycles, but have been known to continue into a fourth and fifth year, and in one instance, up to 10 years. The outbreaks appear to develop explosively, in place, rather than a result of a spread from one geographical area to another. Detection of tussock moth populations at endemic, or low levels, is difficult. Visible defoliation is not usually detectable or adequately assessed until the second year of the outbreak making early detection of epidemic populations difficult.

F. *The Current Outbreak.* Although often referred to as one, there are presently several distinct outbreaks in the Northwest: one in the Blue Mountains of Eastern Washington and Oregon, one in the Colville Indian Reservation, and two in Idaho. In the years 1972 and 1973, the tussock moth defoliated trees on 800,000 acres. Of these, 17,000 acres of forest were completely killed; on an additional 71,000 acres, at least 50 percent of the Douglas fir were killed. In 1974 the Forest Service predicts that 650,000 acres will suffer serious damage if treatment with DDT is not approved. Some of this damage will occur on acreage which has not previously suffered defoliation. This projection is based on the finding of a number of new egg masses in the infested areas. While the number of egg masses is not determinative with regard to the intensity, extent, and possible danger of the infestation, it does indicate a potential for serious damage to the forest resources and environment in 1974.

The age of infestations in the various areas differs, and therefore the moth populations are at different stages of the infestation cycle. The infestation in the Blue Mountains is older and further advanced than those in the Colville area or Idaho. There are probably subinfestations within the larger infestations which may be at different levels of development. It is possible that the nuclear polyhedrosis virus occurred significantly in those populations which were three years old in 1973, but that it did not affect the newer infestations. The varying ages of the moth populations contributes to the difficulty of assessing the impact of the virus.

Approximately two-thirds of the infested area is Federal land; the remainder is owned either by the respective States or private landowners. Indian land comprises 17 percent of the infested area.

G. *Possible Control Methods.* 1. *General Requirements.* In discussing the effectiveness of any control agent for the tussock moth, the following factors should be kept in mind: (1) tests which show conclusively that a substance will kill tussock moth larvae are not necessarily conclusive on the point that the substance will prevent or control tree damage; (2) the effectiveness of control measures depends, in part, upon the intensity of the infestation, particularly the number of larvae per thousand square inches of foliage. This second factor is illustrated by the following example: If the number of larvae per thousand square inches which will cause tree damage or mortality is determined to be 20, then the effectiveness of the control must be measured by its ability to reduce the larvae population below that number. If the level of infestation is 400 larvae per 1000 square inches, a control which is 96 percent effective will reduce the population to 16 larvae per unit. However, if the infestation level is 800 larvae per 1000 square inches, then 96 percent effectiveness will yield a reduction to only 32 per 1000 square inches—a level which could be expected to produce tree damage. Consequently, even a control agent with a relatively high capability to kill larvae (96 percent) may not be effective in preventing losses in a heavy infestation, but would be in a light infestation.

2. *Chemical Controls.* A number of chemical alternatives to DDT have been tested in the past. Tests on the current infestation, carried out in 1973, showed the following results:

(a) *Zectran:* tested on 70,000 acres in 1973, Zectran achieved larval mortality up to 93 percent, but did not provide satisfactory tree protection under the conditions used and the larvae present;

(b) *Carbaryl (Sevin):* in smaller tests, a carbaryl formulation achieved larval mortality up to 90 percent. In one case, where the intensity of infestation was lower, some tree protection was afforded;

(c) *Trichlorfon (Dylox):* 1973 tests showed larval mortality up to 98 percent, and some foliage protection; however, new growth was seriously defoliated;

(d) *Bioethanomethrin and resmethrin:* these synthetic pyrethrins are highly promising results in 1973 tests; however, the adaptation of the most effective application technology to forest uses has not yet been made;

(e) *DDT:* DDT was registered against the tussock moth in 1947. The Forest Service discontinued its use in forests in 1968. Laboratory tests show DDT to be toxic to tussock moth larvae. Field experiments have shown larval mortality to range up to 100 percent when compared to unsprayed check plots in the same infestation. Since DDT was not tested in the field during the 1973 infestation along with the other chemical controls, there is no statistical evidence correlating the use of DDT with prevention of tree mortality. However, there is qualitative evidence from competent authorities based on past use that DDT will control the tussock moth and afford tree protection.

3. *Biological controls.* Biological controls have been tested against the tussock moth in recent years. 1973 tests on two of these showed the following results:

(a) *Bacillus thuringiensis* (BT): already registered against a number of forest pests, BT was tested on 20 acre plots in 1973, and showed larval kill ranging from 80 to 98 percent in a new formulation;

(b) *Polyhedrosis virus:* this is the natural virus which normally causes collapse of tussock moth infestations. Applied artificially in 1973, the virus achieved larval kill up to 97 percent. The safety of artificially cultivating and distributing the virus on a wide-scale basis is still under considerable debate.

H. *Uncertainties.* From the foregoing discussion, it should be clear that the Agency presently lacks considerable data which, ideally, should be assessed before a decision is made. Unfortunately, this is very often the case in decisions concerning the protection of the environment given the complexities of the ecological system and uncertainties surrounding the environmental impacts of change introduced by man.

In the present case uncertainties occur in the following areas:

(1) The relationship between the intensity of larval populations and damage to trees;

(2) The efficacy of controls to prevent damage;

(3) The exact economic and social impact of a decision not to control the infestation;

(4) The extent of the virus population this year and its relationship to the potential collapse of some or all the infestations.

II. *The Decision.* Although under optimum conditions this Agency would postpone the decision on the Forest Service's contingency request until more of the uncertainties could be resolved, this option is not realistically open. A decision must be made at this time in order that planning and contractual arrangements for the 1974 control program may be made. If the EPA decision is positive, the Forest Service must know early in order to obtain supplies of DDT in the proper formulations, to contract for the application of the material, and to initiate the necessary research and monitoring planning, and design the operational procedures and the performance training which would ensure that the most environmentally sound application procedures are used. On the other hand, if the EPA decision is negative, the Forest Service and the involved State agencies must now begin to evaluate the practicality of fall-back actions which might be desirable.

If a dramatic decrease in the level of these uncertainties were possible or likely

ment, are not required as they are in other sections of the Act. Nevertheless, a consideration of the risks and benefits is desirable when, as in this case, a significant quantity of a cancelled pesticide is proposed for use.

In order to find guidance for consideration of the risks and benefits of DDT, this Agency has turned to the June 14, 1972, EPA Order which cancelled most uses of DDT after a seven month hearing. This decision has been upheld by the U.S. Court of Appeals for the District of Columbia. Even though this decision was made under a different section of FIFRA, one which required extensive risk/benefit balancing, this order provides a lens through which the Forest Service request may be viewed.

The 1972 order found substantial risks associated with DDT. Specifically, the order found that DDT has acute and subacute effects on aquatic and avian species and that it can have adverse reproductive impacts on certain birds. Laboratory tests indicate that DDT produces tumors in test animals and is a potential carcinogen to man. The persistence of the chemical in the environment increased the Agency's concern about these effects.

The order concluded that the use of DDT on cotton and most other crops should be cancelled so as to stop the major contribution of DDT to the global ecology by the United States. The order recognized, however, that there would have to be exceptions to this general policy. These exceptions are for those situations where the benefits outweigh the risks because of such factors as:

(a) the unavailability of practical alternative means of control;

(b) the temporary nature of the use because of the need for a transition period to an alternative control method or to an alternative crop;

(c) the possibility of minimizing the impact on the environment because of restrictions which could be imposed on the specific use.

These guidelines are helpful in analyzing the Forest Service's request:

(a) EPA finds no reason to depart from the findings of the 1972 order with regard to the potential risks of DDT.

(b) As discussed above, there is no clear alternative means of control for the tussock moth.

(c) The proposed use is temporary. The Forest Service has asked for an exemption to use DDT only for the 1974 control season. It is EPA's expectation that alternative means of control will be available for post-1974 outbreaks. While substantial quantities of DDT would be introduced into the environment, the proposed Forest Service use would be only short-term.

(d) The risks to the environment in this instance can be minimized by placing controls on the way the program is conducted. In addition, prespray surveys and assessment of the viability of the egg populations after the winter can aid in holding to a minimum necessary the acreage where control is needed. It is possible that the egg masses will overwinter poorly, or that the virus will increase such that the need for chemical control is reduced. Careful assessment of these indicators can be made to insure that no unnecessary application of DDT would be made.

III. *Conclusions.* For all of the foregoing reasons, this Agency concludes that the 1974 tussock moth situation in the Northwest meets the requirements of section 15 of FIFRA and that the Forest Service should be granted its contingency request for an exemption from the provisions of FIFRA which prohibit the use of cancelled pesticides, specifically, the use of DDT. As noted above, it is the Agency's hope that an actual emergency requiring the use of DDT this summer will not occur. Against the very real possibility, however, that the conditions needed to prevent an emergency will not develop, the EPA has granted the Forest Service an exemption from the prohibitions of the FIFRA so that contingency preparations for the use of DDT can be made. In the interest of achieving a uniform program embodying consistent criteria for the identification of areas to be sprayed and standard operational controls which minimize the environmental impact of DDT use, the requests of the States of Washington and Oregon are denied. It is this Agency's understanding and expectation that the Forest Service will meet the control needs in these States. The Forest Service's exemption is granted subject to the following restrictions and requirements:

A. *Spray Restrictions.* 1. The laboratory hatch of egg masses shall be carried out, and all acreage eliminated where larval incidence is too low to justify DDT use or where viral incidence will control the outbreak without such use. The validity of the laboratory data shall be verified by field surveys carried out at the time of natural egg hatch. The Forest Service should make every effort to refine both laboratory and field criteria for the above factors so that no acreage is sprayed unnecessarily;

2. An unsprayed buffer strip of at least 200 feet shall be left along live streams and waterways. Helicopter applicators shall take meteorological conditions into account and adjust spray courses and timing to ensure that DDT does not drift into these buffer strips.

3. Live streams and waterways shall be clearly marked on maps and photo aids for pilots. In addition, these water areas shall be marked with flags, balloons, and kytoons to avoid accidental spraying of water;

4. Payment of applicators shall be related to amount of spray actually reaching the target areas.

5. No spraying is to take place where winds exceed 6 m.p.h., or where temperature inversions exist. Meteorological conditions shall be verified by competent meteorologists on the ground at the spray site;

6. To the extent possible, livestock and other domestic animals shall be removed from the treatment area. Hunters shall be informed as to the possibility of DDT residues in game animals taken from the spray area;

7. Warnings shall be prominently placed in public places within all areas to be sprayed, giving the date, time and duration of the spray project;

8. Applicators shall be licensed by their respective States, and shall be trained both on general procedures and in the field at the site of the spray project. Demonstrable familiarity with the geographical features of the spray area, especially waterways, is essential;

9. Deposition of spray at the target shall be monitored during the actual spray, using appropriately sensitized cards;

10. Spray boundaries shall be indicated by the use of flags, balloons and kytoons;

11. Complete records of the spray project shall be kept, including locations, quantity, times and places, and shall be furnished to EPA and the public within ten days of completion of the project.

B. *Research Requirements.* The development of reliable, registerable alternatives to DDT for forest pest management must become a first priority for the Forest Service. Consequently, before the commencement of any spray program the Forest Service shall take whatever steps are necessary to assure that research will be carried out which, if successful, will be sufficient to support a registration request for the possible alternatives to DDT. This research must be completed in time to submit the necessary documents to EPA no later than December 1, 1974. This research must not be limited to the determination of whether alternative chemicals kill tussock moth larvae, but must be designed to meet the effects and efficacy requirements of the FIFRA. Specifically, data must be developed which can be used to assess the capability of a control mechanism to prevent tree defoliation and or tree mortality.

In addition the research program must include:

1. Further testing of Zectran to follow up on the 1973 tests. Particular attention should be paid to development and use during the test of the most effective methodology;

2. Further testing of resmethrin and bioethanomethrin with emphasis upon solving problems in application methodology;

3. Expanded testing of carbaryl and trichlorfon on larger test plots;

4. Conduct of statistical evaluations of the efficacy of DDT in preventing tree damage and mortality. In addition, experiments shall be conducted which test the efficacy of DDT at lower application rates. While it is the Agency's belief that with a conscientious effort to find an alternative to DDT, the use of this chemical will not be sought in the future, it would be foolish not to develop definitive data on the efficacy of this use;

5. Research designed to better define the correlation between the intensity of egg mass and larval populations, virus incidence, and tree damage and or mortality. This research effort should have particular emphasis on improving ability to predict infestation intensity and resultant tree damage from early indicators.

The Agency is willing to work with the Forest Service and others in the development of the final research plan, particu-

during the next one to two months, the Agency would be more disposed toward delaying this decision despite the severe difficulties this could cause in the structuring of the 1974 control program. This is not, however, the case, and EPA is reluctantly persuaded that a decision must be made now as to whether the present situation qualifies for an exemption under section 18 of the FIFRA.

A. *Legal Parameters of the Decision*

Section 18, in its entirety, reads as follows:

> The Administrator may, at his discretion, exempt any Federal or State agency from any provision of this Act if he determines that emergency conditions exist which require such exemption.

On December 3, 1973, EPA published final regulations for this Section setting forth general requirements and the procedures to be followed (38 FR 33303). Section 166.1 of these regulations sets forth the parameters of decisions under this Section of the Act:

> An emergency will be deemed to exist when: (a) A pest outbreak has or is about to occur and no pesticide registered for the particular use, or alternative method of control, is available to eradicate or control the pest, (b) significant economic or health problems will occur without the use of the pesticide, and (c) the time available from discovery or prediction of the pest outbreak is insufficient for a pesticide to be registered for the particular use. In determining whether an emergency condition exists, the Administrator will also give consideration to such additional facts requiring the use of section 18 as are presented by the applicant.

In applying these criteria to the Forest Service request, the Agency has determined that emergency conditions do exist which require such an exemption from the requirements of FIFRA. This exemption is not a directive from this Agency that DDT should be used this summer against tussock moth. It is the hope of the EPA that an actual emergency will not arise in the Northwest at the time of egg hatch and that spraying of DDT will not be necessary. This Agency's decision to grant this contingency request is based on the following findings:

1. *A pest outbreak has or is about to occur and no pesticide registered for the particular use, or alternative method of control, is available to eradicate or control the pest.*

(a) *Occurrence of an Outbreak.* The law does not require EPA to find that an actual emergency exists at the time of the decision. Instead the Agency must find that emergency conditions exist. This is an important distinction which embodies Congress' recognition that there are times when EPA's decision cannot await the actual start of an emergency since this would delay, and thereby effectively deny, the requested relief. This distinction is reflected in the regulations by the specification that EPA may find that a pest outbreak has or is about to occur (emphasis added). In the case of the pending Forest Service request, it is clear that the tussock moth activity is not, today, causing an emergency. The moths are in the egg stage, and no defoliation is now occurring. It is known, however, that when the eggs hatch, the larvae possess the potential for severe defoliation or tree mortality, and that the extent of that potential can only be determined very near the time when control measures would have to be taken in order to avoid tree damage.

(b) *Effective Means of Control.* The regulations also require EPA to examine alternative means of control. Clearly, if a registered pesticide, or other means of control which the Agency is prepared to recommend as a substitute, could afford practical, effective control, the need for an exemption under section 18 would be obviated. A number of controls which are not registered have, however, been considered by the Forest Service and EPA. These are the various chemical and biological controls discussed earlier in this Order. Although the Agency would wish to have better data on the efficacy of all of these controls, available evidence indicates that DDT will give better assurance of effectively controlling tussock moth damage than any of the alternatives available at this time.

2. *Significant economic or health problems will occur without the use of the pesticide.*

The Forest Service is projecting losses of $67 million this year if the emergency develops and no control is instituted. Although these projections can vary substantially depending on alternative accounting procedures which could be used, they are significantly higher than the April 1973 projection of $12.9 million which formed part of the basis for the Agency's decision last year that the risks outweighed the benefits of DDT use against the tussock moth. The fact that the Forest Service now estimates that the 1973 actual losses were $77 million illustrates a crucial point. The biology of the tussock moth, our ability to predict the extent of the infestation and the resulting damage, and the volatility of the supply and demand of timber make economic impact projections uncertain until the infestation takes its toll.

The decision last year was based to a large extent on the expectation that the natural virus would bring about the collapse of the moth population and thereby reduce the damage and the threat of future losses. Although the surveys this Spring will provide more definitive data on the extent of the virus population, it is already clear that last year the impact of the virus was less than was necessary to bring the infestation under control. In addition, new egg masses have been found since last year.

The projected economic impact, though perhaps small when seen from a national point of view, can be catastrophic on a regional or local level. Even if the actual economic impact were to prove to be considerably smaller than the total now projected by the Forest Service, the local impact would most probably be severe. Of particular concern are the Indian lands which comprise 17 percent of the infested area. Forty to 50 percent of Indian employment is directly in the forestry industry, and this industry generates about 95% of tribal income.

Any consideration of the economic and health impact of this infestation must consider the potential fire hazards resulting from defoliation. Forest fires are related to soil temperatures, water content, and fuel, all of which may be affected by severe defoliation.

While there is no way of estimating the probability of a major forest fire in the watershed area, the Forest Service estimates that, in areas of total defoliation, available fuel is four times greater than normal. This will change the nature of any fire outbreak, and will increase the speed at which a fire can spread from about four acres per hour to 25 acres or more per hour.

In light of the above factors, EPA concludes that the economic and health impact which will occur without the use of the pesticide will be significant.

3. *The time available from discovery or prediction of the pest outbreak is insufficient for a pesticide to be registered for the particular use.*

DDT was registered for use against the tussock moth at a time when its potential effects on man and wildlife were not known. FIFRA as amended in 1972 requires the Agency to find as a condition of registration under section 3 that the pesticide will perform its intended function without unreasonable adverse effects on the environment. Because exemptions under section 18 are given only when emergency conditions exist, are limited to time, and can be made very specific with regard to time, place, and manner of application, the information requirements for a section 18 exemption can be less than registration requirements under section 3 of the Act.

Registration of a pesticide under section 3 for use against the tussock moth would require extensive and replicated data on the efficacy and the environmental effects of such use. The biology of the tussock moth and the conditions necessary for determining the effectiveness of a pesticide in preventing tree damage (as contrasted with killing larvae), make it very difficult to conduct meaningful research on the efficacy of a particular pesticide except during a large infestation. As a result, last year was the first time since the 1972 order that field research on the efficacy of alternative control methods could have been initiated. The amount of research done at that time fell far short of what, in hindsight at least, was clearly required. Nevertheless, it is unlikely that any research program, no matter how extensive, would have produced in the space of one year evidence adequate to register a pesticide for use against the tussock moth, given the inconclusive results for the various alternative controls in the research program last year. The Agency finds therefore, that there has not been sufficient time for the Forest Service or others to obtain registration for a pesticide for use against the tussock moth since the 1972 Order of this Agency.

4. *Risks and Benefits.* In determining whether emergency conditions exist which require an exemption under section 18, extensive balancing of risks and benefits, and determination of no unreasonable adverse effects on the environ-

larly in giving guidance on experimental design as it relates to registration requirements.

C. *Monitoring Requirements.* The Forest Service and affected State agencies must adhere to the general requirements of the monitoring plan which has been submitted to EPA. In addition to the program put forth in that plan, the Forest Service shall conduct pre- and post-spray sampling of forest litter and vegetation.

D. *Labelling.* In accordance with § 166.11 of the regulations (38 FR 33307) adopted pursuant to section 18 of the FIFRA as amended, Montrose Chemical is hereby authorized to ship not to exceed 500,000 pounds of DDT for use by the U.S. Forest Service as provided by this Order, under a label to be specified by this Agency.

E. *Other Considerations.* EPA reminds the Forest Service of the requirements of the Wild and Scenic Rivers Act (82 Stat. 906), the Bald and Golden Eagle Protection Act (16 USC 668), and the Endangered Species Act of 1973 (87 Stat. 884). While the granting of this exemption under section 18 of FIFRA is not incompatible with these statutes, the geographic area involved in the proposed spray program contains features significant in terms of each of these laws and their requirements must be met.

RUSSELL E. TRAIN,
Administrator.

FEBRUARY 28, 1974.

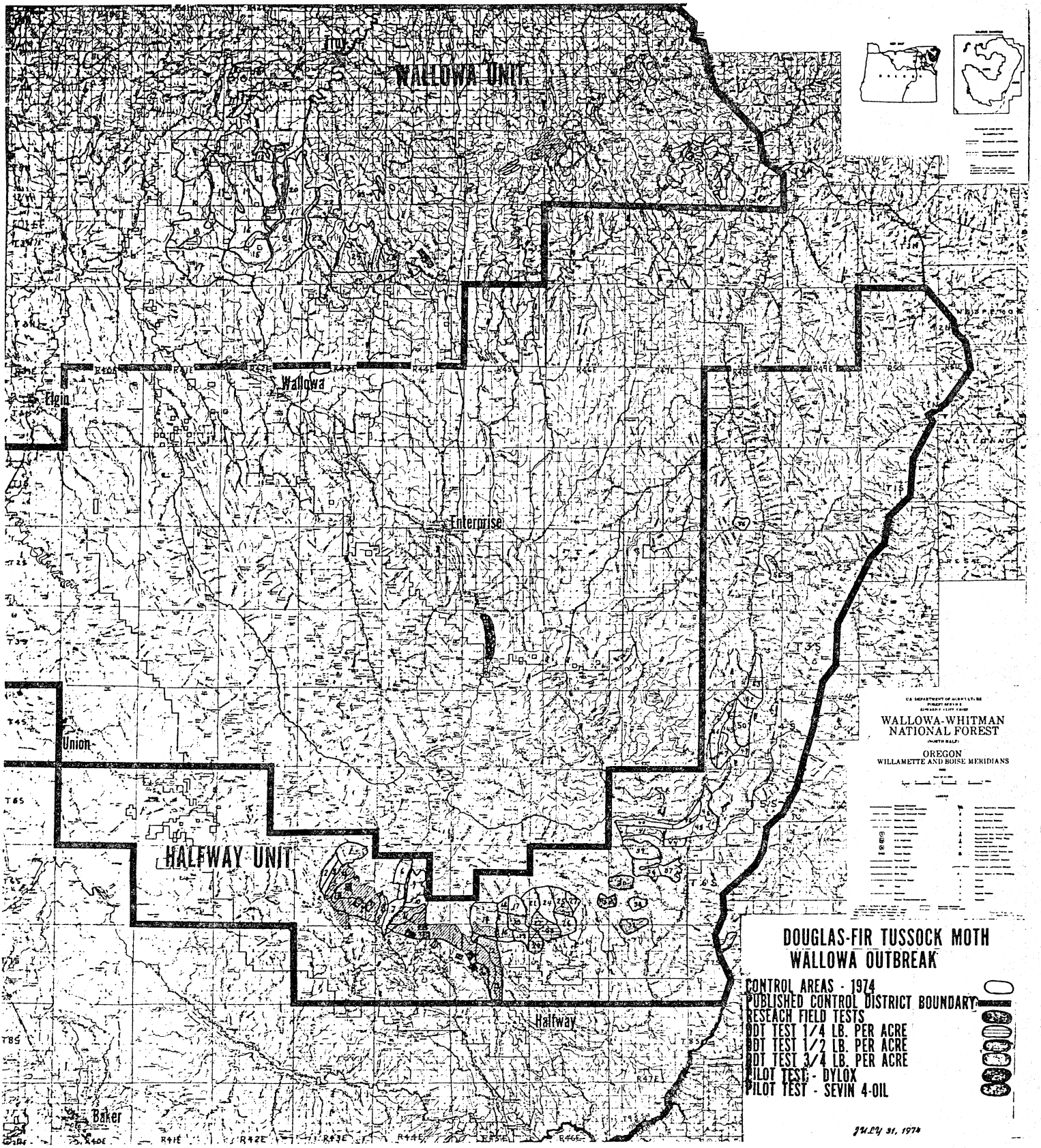
[FR Doc.74-5067 Filed 3-4-74;8:45 am]

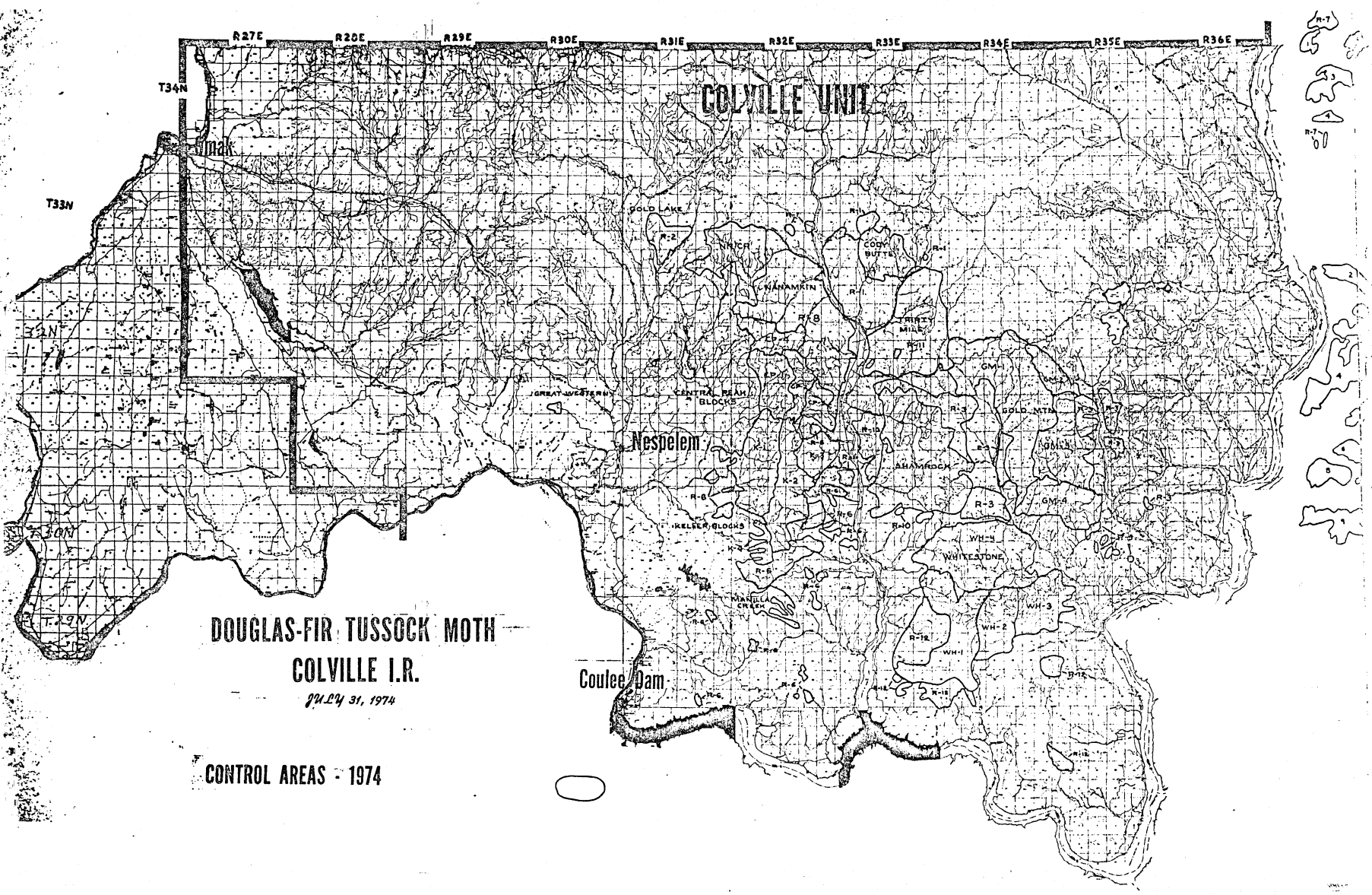
DDT 3/4 lbs/acre--Project Unit Breakdown

Unit Name	Halfway		Wallowa		LaGrande		Colville		Pomeroy		St. Joe		Sawtooth		Total	
State	Oregon		Oregon		Oregon		Washington		Washington		Idaho		Idaho			
	Acres	Gals. Sprayed	Acres	Gals. Sprayed	Acres	Gals. Sprayed	Acres	Gals. Sprayed	Acres	Gals. Sprayed	Acres	Gals. Sprayed	Acres	Gals. Sprayed	Acres	Gals. Sprayed
Treated Planned areas	28,015	26,341	79,917	77,878	29,377	27,505	113,128	122,290	17,174	16,437	73,072	73,072	1,100	1,045	341,783	344,568
Visible damage areas	5,695	5,036	8,500	9,469	8,674	8,040	54,110	53,731			2,182	2,182			79,161	78.458
Total Treated	33,710	31,377	88,417	87,347	38,051	35,545	167,238	176,021	17,174	16,437	75,254	75,254	1,100	1,045	420,944	423,026
Start of Spraying	June 18		June 19		June 21		June 9		June 20		June 19		June 17			
Completion of Spraying	July 17		July 21		July 25		July 2		July 2		July 8		June 21			

Project Summary by State

State	Material	Acres	Gallons
Oregon	*3/4 lb./acre	160,178	154,269
	*1/2 lb./acre	2,530	2,879
	*1/4 lb./acre	3,085	2,227
	Sevin-4-oil	2,495	2,264
	Dylox	2,215	2,408
Washington	*3/4 lb./acre	184,412	192,458
Idaho	*3/4 lb./acre	76,354	76,299
	Sevin-4-oil	1,350	1,350
Total		432,619	434,154
*DDT			


WALLOWA UNIT
HALFWAY UNIT
Elgin
Wallowa
Enterprise
Union
Halfway
Baker
WALLOWA-WHITMAN
NATIONAL FOREST
OREGON
WILLAMETTE AND BOISE MERIDIANS
DOUGLAS-FIR TUSSOCK MOTH
WALLOWA OUTBREAK
CONTROL AREAS - 1974
PUBLISHED CONTROL DISTRICT BOUNDARY
RESEACH FIELD TESTS
DDT TEST 1/4 LB. PER ACRE
DDT TEST 1/2 LB. PER ACRE
DDT TEST 3/4 LB. PER ACRE
PILOT TEST - DYLOX
PILOT TEST - SEVIN 4-OIL
JULY 31, 1974


COLVILLE UNIT
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R28E
R29E
R30E
R31E
R32E
R33E
R34E
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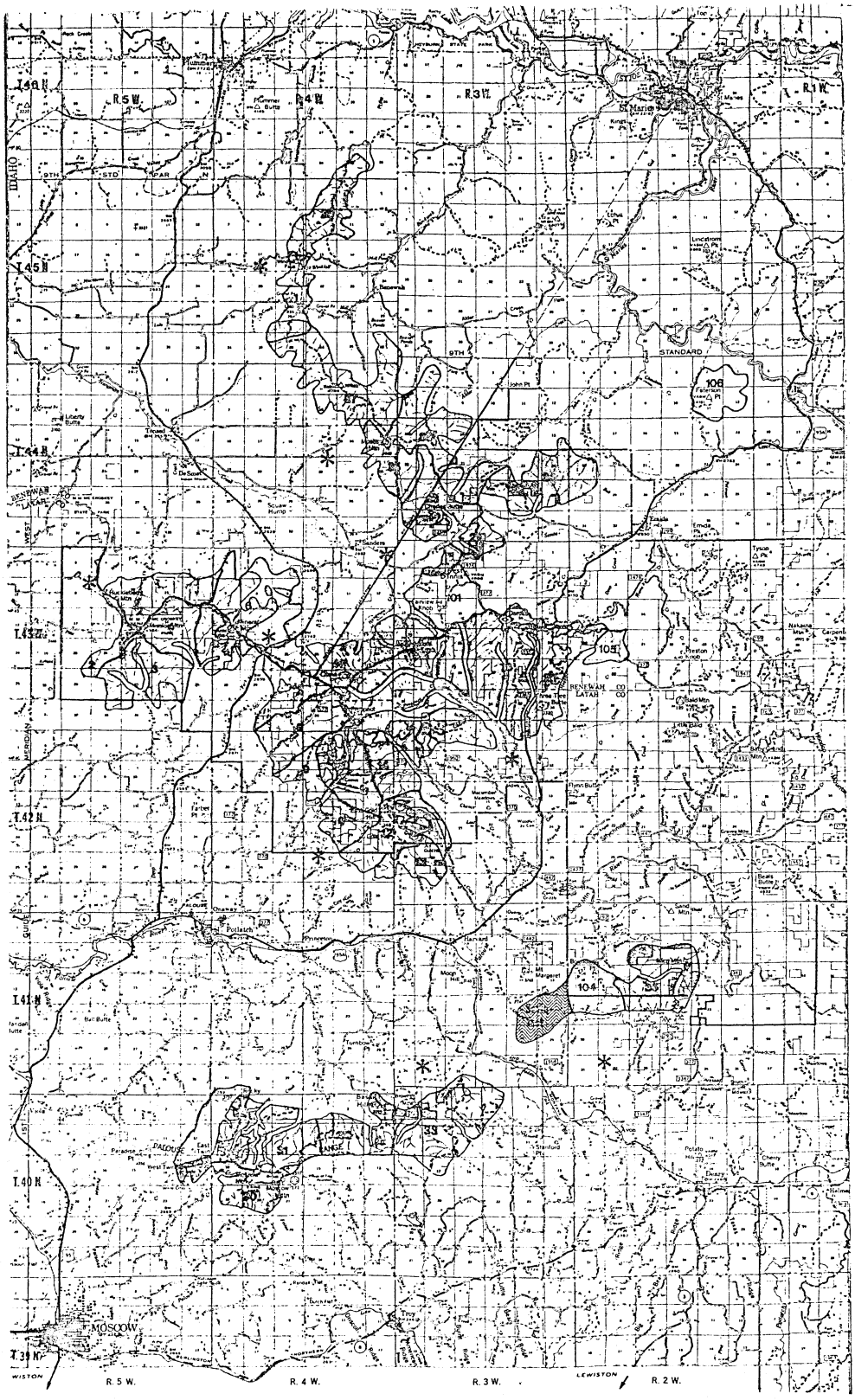
T33N
T32N
T31N
T30N
T29N
Omak
Nespelem
Coulee Dam
GOLD LAKE
COPPER BUTTE
NANAMKIN
THREE MILE
GREAT WESTERN
CENTRAL PEAK BLOCKS
GOLD MTN.
ANAMROCK
KELLER BLOCKS
WHITESTONE
MANELLA CREEK
DOUGLAS-FIR TUSSOCK MOTH
COLVILLE I.R.
JULY 31, 1974
CONTROL AREAS - 1974

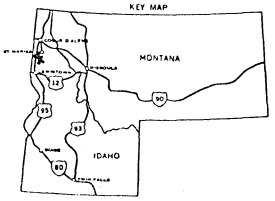


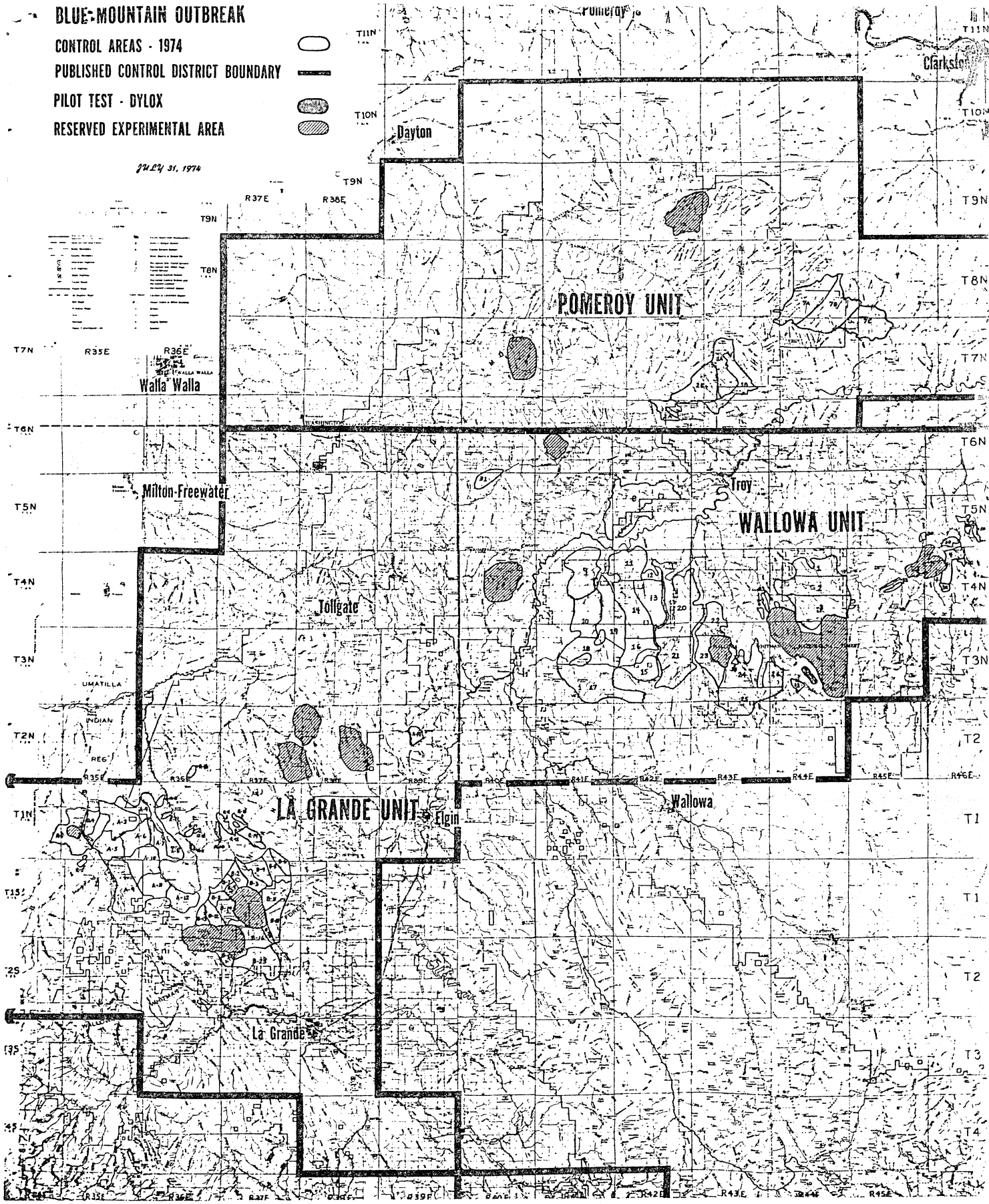
NORTH IDAHO DOUGLAS-FIR TUSSOCK MOTH CONTROL PROJECT 1974

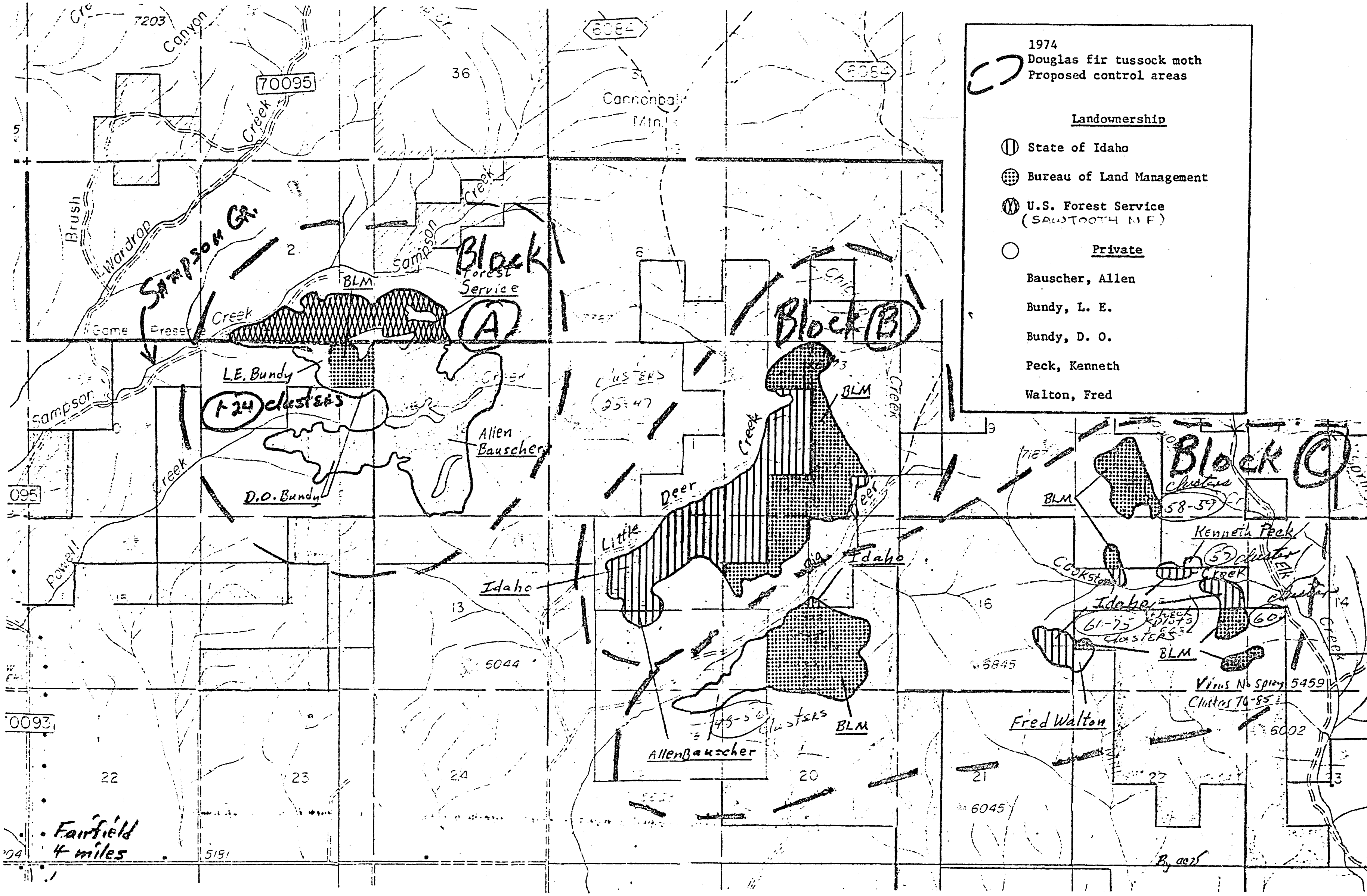
SPRAY BLOCKS 1–35
UNSHADED AREAS = UNTREATED
SENSITIVE AREAS AND PORTIONS
DELETED DUE TO LOW POPULATION

CHECK AREAS
UNTREATED BLOCKS 101, 104, 105, 106

SEVIN–4–OIL TEST AREA




BLUE-MOUNTAIN OUTBREAK
CONTROL AREAS - 1974
PUBLISHED CONTROL DISTRICT BOUNDARY
PILOT TEST - DYLOX
RESERVED EXPERIMENTAL AREA
JULY 31, 1974
POMEROY UNIT
WALLOWA UNIT
LA GRANDE UNIT
Pomeroy
Dayton
Clarkston
Walla Walla
Milton-Freewater
Troy
Tollgate
Elgin
Wallowa
La Grande
UMATILLA INDIAN RES.
T11N
T10N
T9N
T8N
T7N
T6N
T5N
T4N
T3N
T2N
T1N
T1
T2
T3
T4
R35E
R36E
R37E
R38E
R39E
R40E
R41E
R42E
R43E
R44E
R45E
R46E


1974
Douglas fir tussock moth
Proposed control areas
Landownership
State of Idaho
Bureau of Land Management
U.S. Forest Service
(SAWTOOTH N F)
Private
Bauscher, Allen
Bundy, L. E.
Bundy, D. O.
Peck, Kenneth
Walton, Fred
Block A
Block B
Block C
Forest Service
Sampson Cr.
Sampson Creek
L.E. Bundy
1-24 clusters
Allen Bauscher
D.O. Bundy
Clusters 25-47
Little Deer Creek
BLM
Idaho
Allen Bauscher
48-56 Clusters
Clusters 58-59
Kenneth Peck
Fred Walton
61-75 clusters
Virus No Spray 5459
Clusters 76-85
Cookston Creek
Brush
Wardrop
Canyon Creek
Powell Creek
Cannonball Mtn
Game Preserve
Fairfield 4 miles
70095
70093
6084
7203
6044
5845
6045
6002
5191